

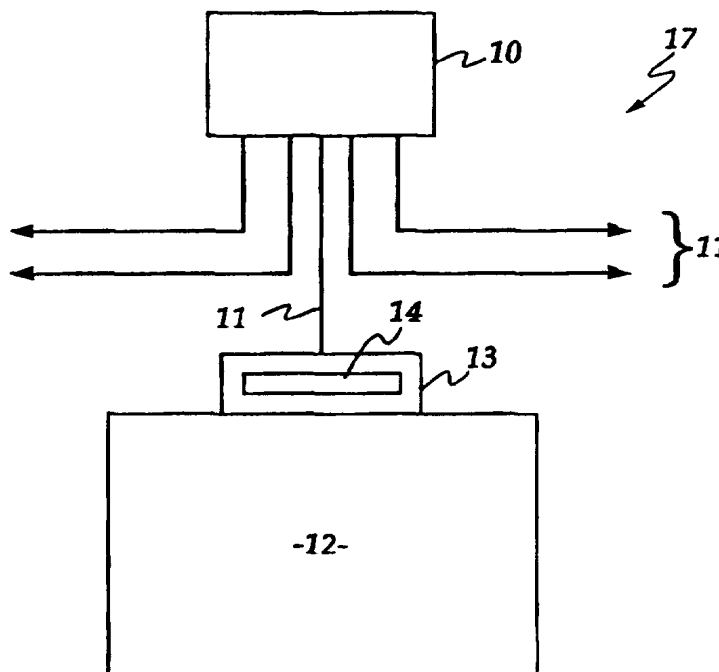


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : F24F 3/12, 3/14, 13/06, A61L 9/14	A1	(11) International Publication Number: WO 97/10475 (43) International Publication Date: 20 March 1997 (20.03.97)
(21) International Application Number: PCT/AU96/00567 (22) International Filing Date: 10 September 1996 (10.09.96) (30) Priority Data: PN 5454 14 September 1995 (14.09.95) AU (71)(72) Applicant and Inventor: JACOBS, David, Ian [AU/AU]; 115 Collins Road, St. Yves, NSW 2075 (AU). (74) Agents: RAINEY, David et al.; Pizzey's, P.O. Box 291, Woden, ACT 2606 (AU).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: AIR CONDITIONING SYSTEM**(57) Abstract**

A system for conditioning the air in a discrete space is disclosed which includes: air supply means (10); distribution means (11) for distributing air from the air supply means to the discrete space (12) and air outlet means (13) associated with the discrete space for the supply of air from the distribution means to the discrete space; wherein the air outlet means includes conditioning means (14) for conditioning the air being supplied from the distribution means to the discrete space. An air treatment assembly for treating the air in a discrete space is also disclosed, the assembly including: means for dehumidifying and circulating the air in the discrete space, and conditioning means for conditioning the air being circulated.



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"AIR CONDITIONING SYSTEM"**Technical Field**

This invention relates to an air conditioning
5 system.

The invention has particular but not exclusive application to systems for conditioning the air in a building by releasing a conditioning agent into an air flow entering the building.

10

Background of Invention

It is well known for the air in a building to be conditioned, as for example by adding deodorants and the like to the air.

15

Summary of Invention

The present invention aims to provide an alternative to known systems for conditioning the air in a building.

This invention in one aspect resides broadly in a
20 system for conditioning the air in a discrete space, the system including:-

air supply means;

distribution means for distributing air from the air supply means to the discrete space, and

25 air outlet means associated with the discrete space for the supply of air from the distribution means to the discrete space;

wherein the air outlet means includes conditioning means for conditioning the air being supplied from the
30 distribution means to the discrete space.

In another aspect this invention resides broadly in an outlet for an air conditioning system for supplying air from air distribution means to a discrete space, the outlet including:-

35 conditioning means for conditioning the air being supplied from the distribution means to the discrete space.

In a further aspect this invention resides broadly

in a method of conditioning the air in a discrete space, the method including:-

supplying air from air distribution means to the discrete space through outlet means, and

5 locating conditioning means at the outlet for conditioning the air being supplied from the distribution means to the discrete space.

The conditioning means may be any suitable means for conditioning the air. In a preferred embodiment the
10 conditioning means includes a carrier medium adapted to release the vapour of an air conditioning agent as the air is being supplied from the distribution means to the discrete space.

Alternatively in another embodiment the conditioning
15 means includes atomising means adapted to release an atomised air conditioning agent into the air being supplied from the distribution means to the discrete space.

The carrier medium may be located in the outlet by
20 any suitable means. Thus for example in a conventional ceiling outlet having an adjustable axially screw-mounted conical deflection vane, the carrier medium may be a cone shaped wafer with a central aperture adapted to receive the mounting screw therethrough for locating the wafer on
25 the vane surface. Alternatively, in a preferred embodiment, the air outlet means includes receiving means for releasably receiving the carrier medium.

It is preferred that the air conditioning agent is, or includes as an active ingredient, oil distilled from
30 trees of the melaleuca species eg melaleuca alternifolia, m. linarlifolia and m. dissitiflora. Most preferably the tree from which the oil is distilled is melaleuca alternifolia.

Suitably the carrier medium is a wafer of material
35 containing the oil, the material being adapted to control the release of the oil as air being supplied from the air distribution means to the discrete space passes over the material.

The system may operate passively by locating the conditioning means in the system and leaving it until replacement is required. Alternatively the system may be adaptive to cater for variations in the condition of the air and accordingly the system may include monitoring means for monitoring selected parameters indicative of the condition of the air in the discrete space, and

conditioner adjusting means for adjusting the supply of conditioning agent to the conditioning means in accordance with the output of the monitoring means.

It is preferred that the system and method includes de-humidifying means for de-humidifying the air in the discrete space. The de-humidifying means can be a heating means.

In another aspect this invention resides broadly in an air treatment assembly for treating the air in a discrete space, the assembly including:-

air de-humidifying and circulating means for de-humidifying and circulating the air in the discrete space, and

conditioning means for conditioning the air being circulated.

The air de-humidifying and circulating means can for example be a low temperature convection coil or strip heater. However it is preferred that the air de-humidifying and circulating means includes air blower means for blowing air in the discrete space.

In a preferred embodiment the conditioning means includes a carrier medium adapted to release the vapour of an air conditioning agent as the air is being circulated. The air treatment assembly may include receiving means for releasably receiving the carrier medium. It is preferred that the air conditioning agent is oil distilled from trees of the melaleuca species.

The carrier medium is preferably a wafer of material containing the oil, the material being adapted to control the release of the oil as the air is being circulated.

In a further aspect this invention resides broadly

in an air treatment assembly for treating the air in a discrete space for reducing the incidence of asthma and other bronchial conditions, the assembly including:-

5 air de-humidifying and circulating means for de-humidifying and circulating the air in the discrete space, and

air conditioning means adapted to release the vapour of oil distilled from trees of the melaleuca species as the air is circulated.

10 In yet another aspect this invention resides broadly in a method of reducing the incidence of asthma and other bronchial conditions, the method including:-

supplying air from air distribution means to a baby's nursery or the like through outlet means, and

15 introducing an air conditioning agent to the air supply at the outlet means;

wherein the air conditioning agent is oil distilled from trees of the melaleuca species.

20 **Description of Drawings**

In order that this invention may be more easily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention, wherein:-

25 FIG 1 is a schematic diagram of the system for conditioning air in accordance with the invention;

FIG 2 is a schematic diagram of an adaptive system for conditioning air in accordance with the invention;

30 FIGS 3 and 4 illustrate a first embodiment of a system in accordance with the invention;

FIG 5 illustrates a second embodiment of a system in accordance with the invention;

FIG 6 illustrates a third embodiment of a system in accordance with the invention, and

35 FIG 7 illustrates an air treatment assembly for treating air to reduce the incidence of asthma and other bronchial conditions.

Description of Preferred Embodiment of Invention

As can be seen schematically in FIG 1, in an air conditioning system 17, air is supplied from air supply means 10 such as a blower or the like to a discrete space 12 such as a room in a building through the ducting of air distribution means 11. An air outlet 13 in the form of a register or the like allows air to pass from ducting 11 into room 12. Air conditioning means 14 is associated with outlet 13 for conditioning the air entering room 12.

As can be seen with reference to FIG 2, the system may also include monitoring means 15 which monitors selected parameters indicative of the condition of the air in the discrete space such as humidity, dust content etc. In this embodiment conditioner adjusting means 16 adjusts the supply of conditioning agent to conditioning means 14 in accordance with the output of monitoring means 15.

As will be seen subsequently with reference to FIGS 3 to 6, air conditioning means 12 may consist of a number of a number of alternative embodiments.

In the embodiment illustrated in FIGS 3 and 4, an anti-condensation unit or the like 21 is mounted in the ceiling loft. Blower 22 blows air through ducting 23 into a room through ceiling register 24. Ceiling register 24 has a planar deflecting vane 25 and an air-conditioning wafer 26 is located on vane 25.

Wafer 26 contains oil distilled from the tree *melaleuca alternifolia* and is composed of a mixture of polystyrene material encased in a number of layers of polyethylene matrix resins and polymers. The exact composition and thickness of the encasing material will vary with each layer to control the rate of release of the oil as air being supplied from blower 22 to the room passes over wafer 26. The exact composition and thickness of the encasing layers is varied for specific conditions in accordance with a number of parameters such as the size of the space being treated, the duration of treatment required and the nature and severity of the

problem being treated. By determining the composition of the air in the space being treated, a mixture of oils and other compounds can be tailored to deal with a specific problem as diagnosed by the monitor.

5 Alternatively, if the ceiling outlet has an adjustable axially screw-mounted conical deflection vane the wafer may be a cone shaped wafer (not shown) with a central aperture adapted to receive the mounting screw therethrough for locating the wafer on the vane surface.

10 In another embodiment not illustrated, the air outlet means can include receiving means in the form of a slot for releasably receiving the wafer.

As can be seen in FIG 5, a conventional air conditioning system register 31 allows air to pass into a room 32 from ducting 30. An outlet deflector 33 distributes air about the room and a register deflector 34 directs air flowing along ducting 30 toward outlet deflector 33. A number of atomisers 35 are located in the space between deflectors 33 and 34.

20 Atomisers 35 are connected to respective supplies (not shown) of air conditioning agents and are actuated to release the agents in accordance with the condition of the air in the room as monitored by monitors within the room as described with reference to FIG 2.

25 Alternatively as seen in FIG 6, a wafer 36 containing oil can be positioned on the downstream side of deflector 34.

As can be seen in FIG 7, an air treatment unit 40 has a housing 41 with a front grill 44 through which treated air passes under the action of a blower 42. The air is drawn in through vent 48 and heated by low temperature heating coil 43. An electric lead 47 is provided for connecting the unit to a power point. A comb-like wafer 46 containing air conditioning oil is located in the housing via slot 40 and positioned such as to be in the air flow. The de-humidified air is treated with the oil conditioning agent as it passes between the teeth of comb-like wafer 46.

Air containing the oil is circulated through the discrete space and will adhere to walls, furniture and carpets. Over a period of time the oil evaporates back into the air and eventually disperses out of the discrete space.

The oil distilled from the leaves of the tree *melaleuca alternifolia* is quite complex containing mainly terpinenes, terpineols, pinenes, cymones, cineol, sesquiterpenes and sesquiterpinene alcohols. The oil contains two main compounds. Terpinen-4-ol is usually present in the ratio of between 30 and 45 percent of the oil, and cineole is usually present in a ratio of between 2 and 15 percent. The tree is confined to coastal areas of southern Queensland and northern New South Wales and trees from different areas have been found to produce oil having differing proportions of terpinen-4-ol and cineole with the more northerly stands having a lower cineole content. Cineole, although having useful medical qualities has been claimed to be an irritant of skin and mucous membranes and an oil having a lower cineole fraction is preferable for use in the present invention.

Experiments have been conducted to establish that a small quantity of vapour of oil from the *melaleuca* tree species is an effective insecticide against dust mites living in carpets, bedding and furniture.

Dust mites have been shown to extract moisture from the surrounding air. The more humid the air the greater will be the dust mite population that can survive in a given area. The introduction of the mixture containing the oil combined with an anti-condensation unit reduces both humidity and dust content of the air. Reducing moisture first immobilises dust mites thereby reducing their activities such as feeding which in turn reduces allergen output activity. Tests have revealed that for a given discrete space, after a given number of days continued exposure the mixture proves to be lethal and the majority of the dust mites are eliminated. Furthermore, the treatment reduces mould, fungi mildew

and bacteria (which in their own right can be allergenic), and which are believed to be a source of food for dust mites.

5 The use of a blower pressurises the discrete space thereby substantially preventing moisture and dust entering the space so that the effectiveness of the treatment is not diminished by the mixture being diluted from outside sources. The mites and bacteria are thus far more susceptible to the disinfectant properties of
10 the oil and can be more effectively eliminated.

Furthermore the oil is an insect repellent and can makes the environment unpleasant for fleas, spiders flies and other pests. The composition of the oil mixture can be varied to be specific for a particular insect or
15 bacterial problem.

It is believed that dust mites are a major contributing factor in the incidence of asthma in children and it is believed that the utilisation of the oil in conditioning the air in children's rooms and
20 babies' nurseries in accordance with this invention will be efficacious in reducing the incidence of asthma and other bronchial conditions.

Thus the blower illustrated in FIGS 3 and 4 may be utilised, or alternatively in a manner not illustrated, a
25 low volume stand alone fan may be adapted to receive a wafer containing the oil.

It will be realised that the system for conditioning air in accordance with the invention has advantages over known systems. Application of the air conditioning
30 agent at the outlet enables the conditions in individual spaces or rooms to be controlled and also provides a direct and effective control of air conditions in a space.

The system has a number of advantages over known
35 methods of cleansing and conditioning air and has the ability to target a specific discrete space with the appropriate air treatment. The method of treating dust mites in accordance with this invention is less labour

intensive and much more convenient than intensively washing carpets, bedding and clothing. The method of the present invention is cost effective and economical and avoids the use of harsh chemicals.

5 It will of course be realised that whilst the above has been given by way of an illustrative example of this invention, all such and other modifications and variations hereto, as would be apparent to persons skilled in the art, are deemed to fall within the broad
10 scope and ambit of this invention as is herein set forth.

Claims

1. A system for conditioning the air in a discrete space, said system including:-
- 5 air supply means;
 distribution means for distributing air from said air supply means to said discrete space, and
 air outlet means associated with said discrete space for the supply of air from said distribution means to
- 10 said discrete space;
 wherein said air outlet means includes conditioning means for conditioning the air being supplied from said distribution means to said discrete space.
- 15 2. The system as claimed in claim 1, wherein said conditioning means includes a carrier medium adapted to release the vapour of an air conditioning agent as the air is being supplied from said distribution means to said discrete space.
- 20 3. The system as claimed in claim 2, wherein said air outlet means includes receiving means for releasably receiving said carrier medium.
- 25 4. The system as claimed in claim 2, wherein said air conditioning agent is oil distilled from trees of the melaleuca species.
- 30 5. The system as claimed in claim 4, wherein said carrier medium is a wafer of material containing said oil, said material being adapted to control the release of said oil as air being supplied from said distribution means to said discrete space passes over said material.
- 35 6. The system as claimed in claim 1, wherein said conditioning means includes atomising means adapted to release an atomised air conditioning agent into the air being supplied from said distribution means to said

discrete space.

7. The system as claimed in claim 1, and including:-

5 monitoring means for monitoring selected parameters indicative of the condition of the air in said discrete space, and

conditioner adjusting means for adjusting the supply of conditioning agent to said conditioning means in accordance with the output of said monitoring means.

10

8. The system as claimed in claim 1, and including dehumidifying means for dehumidifying the air in the discrete space.

15 9. The system as claimed in claim 8, wherein said dehumidifying means is a heating means.

10. An outlet for an air conditioning system for supplying air from air distribution means to a discrete space, said outlet including:-

20 conditioning means for conditioning the air being supplied from said distribution means to said discrete space.

25 11. An air treatment assembly for treating the air in a discrete space, the assembly including:-

air de-humidifying and circulating means for dehumidifying and circulating the air in said discrete space, and

30 conditioning means for conditioning the air being circulated.

12. The air treatment assembly as claimed in claim 11, wherein said air de-humidifying and circulating means includes air blower means for blowing air in said discrete space.

35

13. The air treatment assembly as claimed in claim 12,

wherein said air de-humidifying and circulating means includes heating means for heating the air.

14. The air treatment assembly as claimed in claim 11,
5 wherein said conditioning means includes a carrier medium adapted to release the vapour of an air conditioning agent as the air is being circulated.

15. The air treatment assembly as claimed in claim 14,
10 and including receiving means for releasably receiving said carrier medium.

16. The air treatment assembly as claimed in claim 14,
wherein said air conditioning agent is oil distilled from
15 trees of the melaleuca species.

17. The air treatment assembly as claimed in claim 16,
wherein said carrier medium is a wafer of material
containing said oil, said material being adapted to
20 control the release of said oil as air being circulated.

18. An air treatment assembly for treating the air in a
discrete space for reducing the incidence of asthma and
other bronchial conditions, the assembly including:-
25 air de-humidifying and circulating means for de-
humidifying and circulating the air in said discrete
space, and

air conditioning means adapted to release the
vapour of oil distilled from trees of the melaleuca
30 species as the air is circulated.

19. A method of conditioning the air in a discrete
space, said method including:-

supplying air from air distribution means to said
35 discrete space through outlet means, and

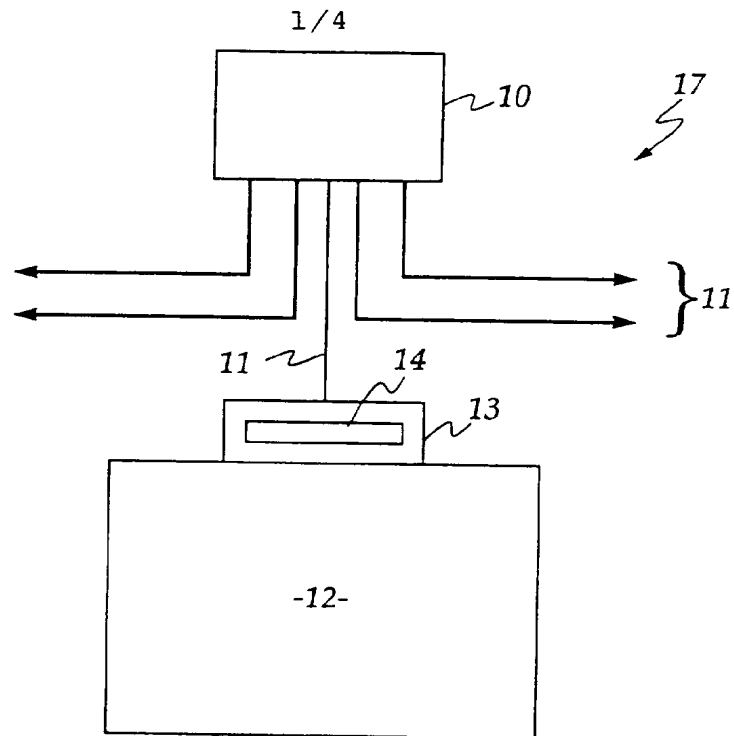
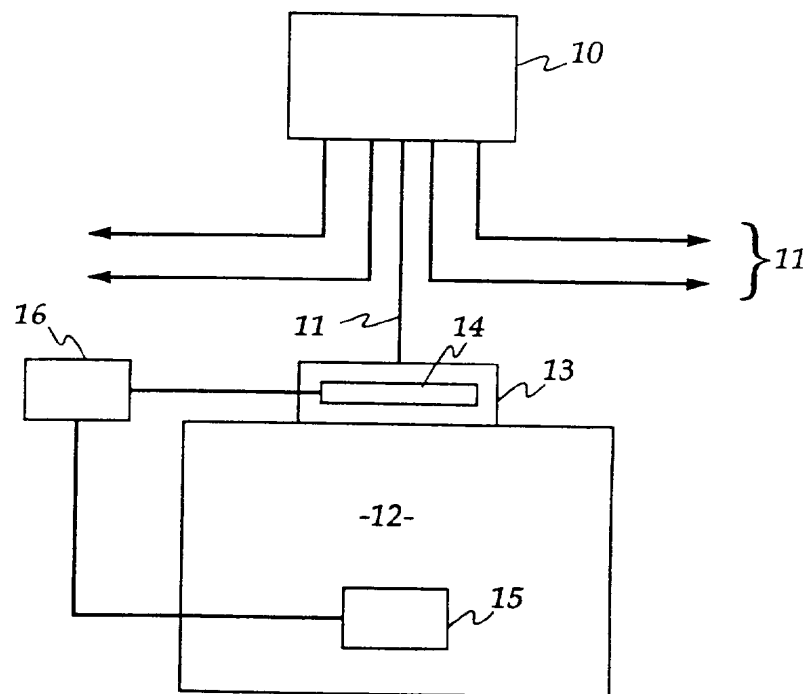
locating conditioning means at said outlet for
conditioning the air being supplied from said
distribution means to said discrete space.

20. A method of reducing the incidence of asthma and other bronchial conditions, said method including:-

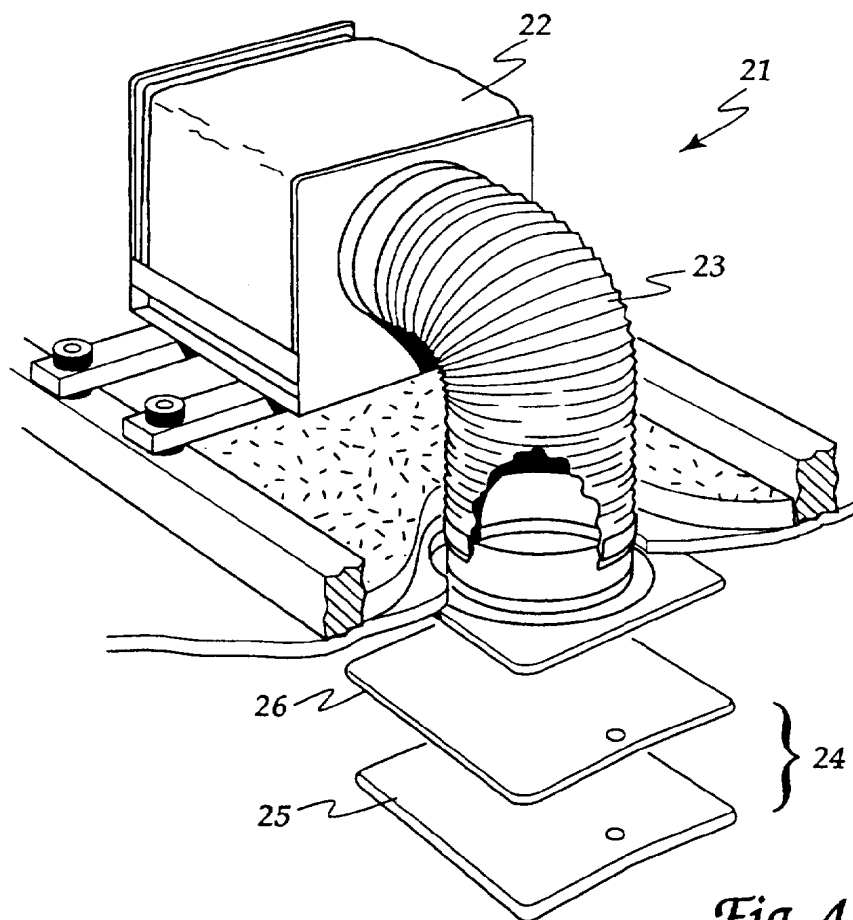
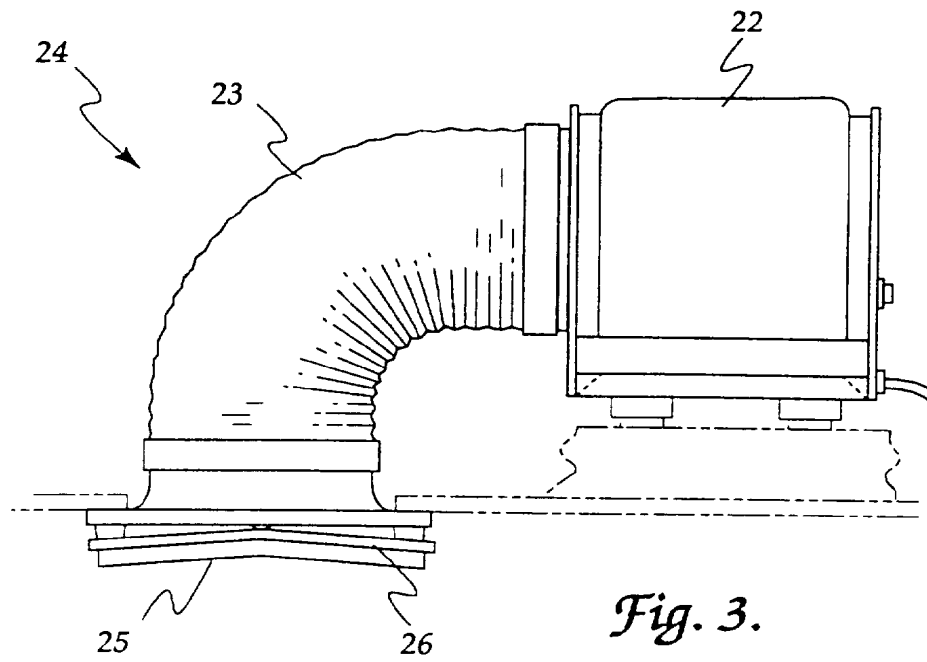
supplying air from air distribution means to a baby's nursery or the like through outlet means, and

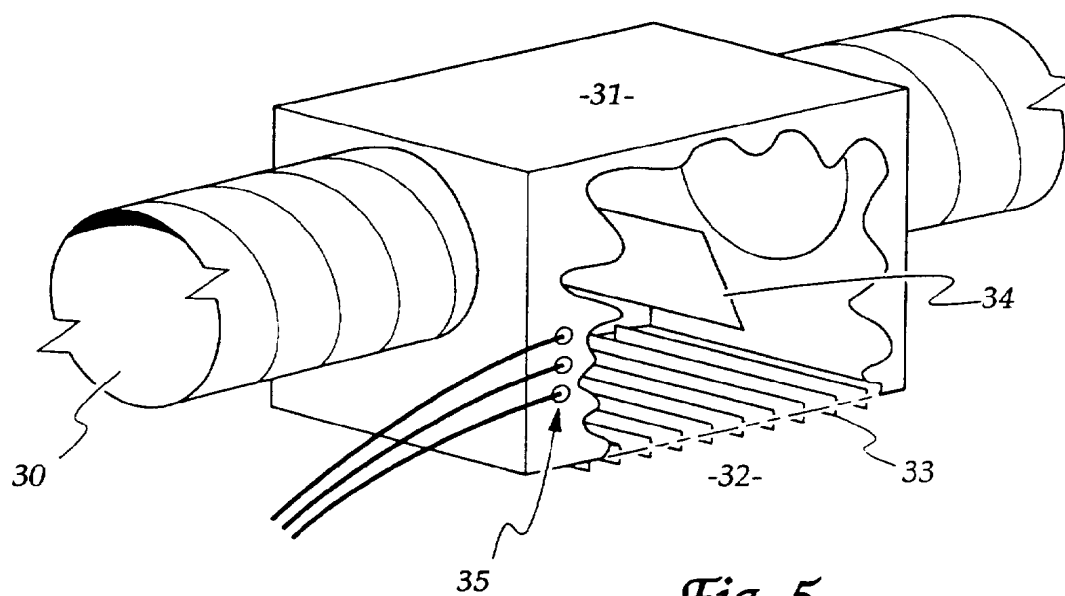
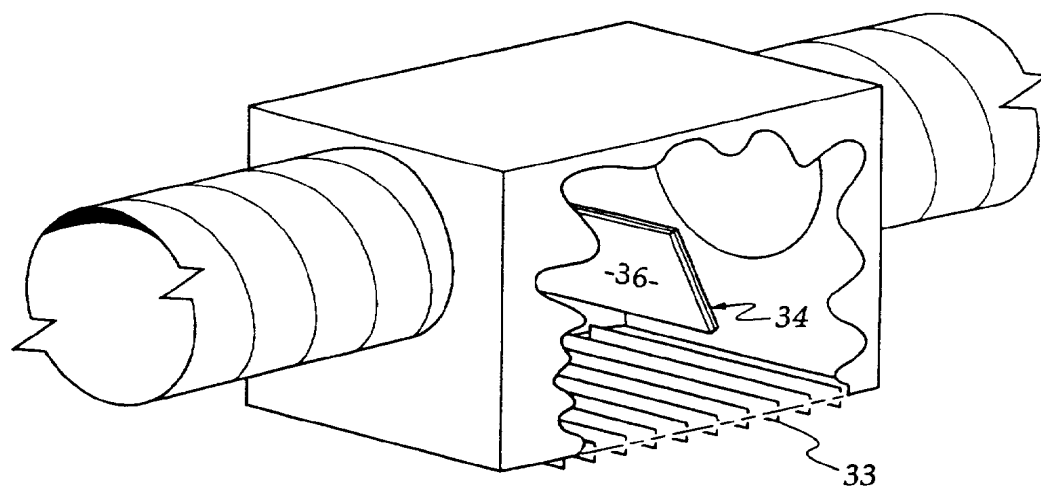
5 introducing an air conditioning agent to the air supply at said outlet means;

wherein said air conditioning agent is oil distilled from trees of the melaleuca species.

*Fig. 1.**Fig. 2.*

2/4



*Fig. 5.**Fig. 6.*

4/4

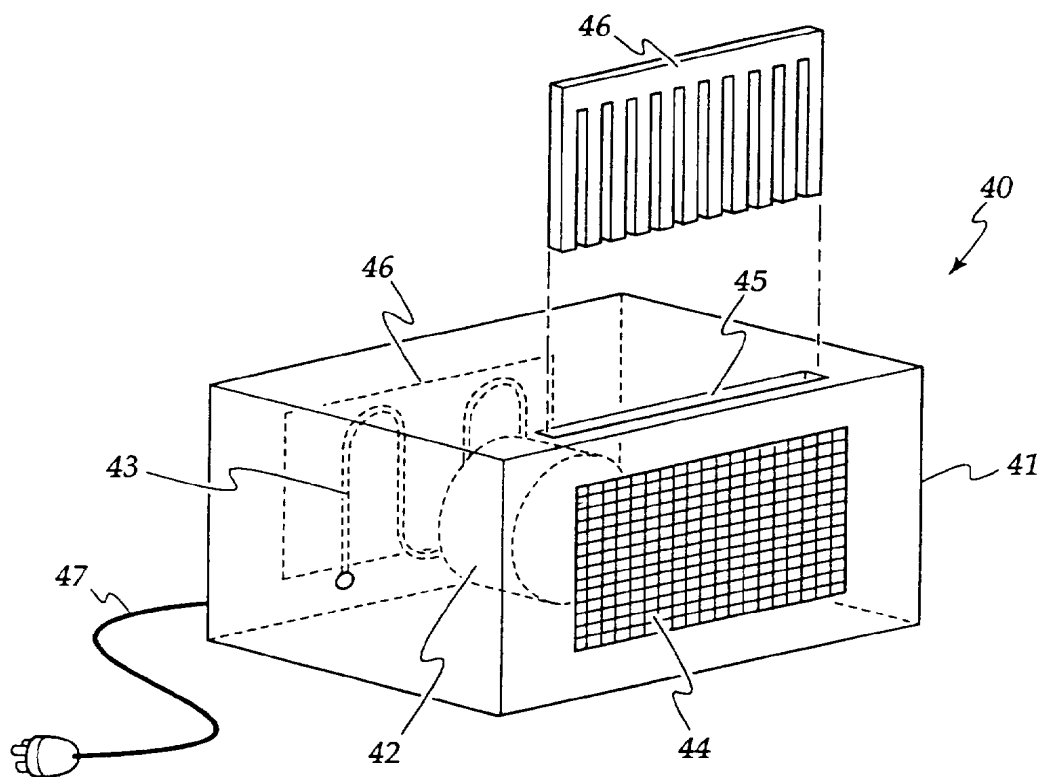


Fig. 7

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 96/00567

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl⁶: F24F 3/12, 3/14, 13/06, A61L 9/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24F, A61L, F25B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Derwent
Japio

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Patent Abstracts of Japan C1022, page 89, JP 4-263863 A (MATSUSHITA ELECTRIC IND CO LTD) 18 September 1992 Abstract	1,6,10,19
X	AU 41292/85 A (GAD ASSAF) 24 October 1985 Whole document, especially figures and claim 1.	11-13
X	WO 91/05573 A (AMERICAN STERILIZER COMPANY) 2 May 1991 Whole document	11,12



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
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 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 "&" document member of the same patent family

Date of the actual completion of the international search
16 December 1996

Date of mailing of the international search report

8 JAN 1997

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C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2117107 A (TAIKISHA LTD) 5 October 1983 Whole document	11,12
A	WO 88/10122 A (COMMONWEALTH INDUSTRIAL GASES LIMITED) 29 December 1988 Whole document	
A	EP 345149 A (SHIMIZU CONSTRUCTION CO. LTD) 6 December 1989 Whole document	
A	DE 3541847 A (METRONIC ELECTRONIC GmbH) 30 July 1987 Whole document	

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 96/00567

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-10, 19-20 directed towards conditioning means located at the outlet of an air conditioning system. It is considered that the conditioning means being located at the outlet comprises a first "special technical feature"
 2. Claims 11-18 directed towards air de-humidifying and conditioning means. This combination of de-humidifying and conditioning means is considered to comprise a second "special technical feature". The conditioning means has not been defined to be at the outlet in these claims.
1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
 2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
 3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
 4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT**Information on patent family members**

International Application No.

PCT/AU 96/00567

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
WO	91/05573	EP	486623	US	5173258		
WO	88/10122	AU	608630	CA	1337044	DE	3851533
		EP	368876				
GB	2117107	US	4488408				
AU	41292/85	CA	1260823	DE	3583776	DK	31/85
		EP	172598	ES	541378	GR	850052
		IL	74015	JP	60248118	US	4803846
EP	345149	CA	1315594	DE	68914195	EP	345149
		JP	1302047	US	5030253		
END OF ANNEX							